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# Final Performance Report

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## STRATEGIC PARTNERSHIP FOR RESEARCH IN NANOTECHNOLOGY (SPRING)

In 2002-2004 the participating universities (*University of Texas at Austin, University of Texas at Dallas, University of Texas at Arlington and Rice University*) established SPRING, a collaborative network of shared centers of intellect and experimental capabilities that will rapidly advance and promote nanotechnology in the region. The mission of SPRING is to foster nanoscience and nanotechnology research, education and technology transfer. SPRING is a collaborative effort between the U.S. Air Force, The University of Texas at Austin, The University of Texas at Dallas, The University of Texas at Arlington, and Rice University. An important and integral part of the SPRING collaboration is the participation of the Air Force Research Laboratory (AFRL) in Dayton, Ohio, which is under the command of the Air Force Materiel Command. The AFRL is a FULL research partner of this collaboration.

SPRING is rapidly building a network of shared centers that will propel this region to the forefront of nanotechnology research. SPRING is achieving this through the development of intellectual and experimental centers for nanotechnology research that enable research collaborations both internal and external to the SPRING partnership, and instrumentation usage by companies and other universities throughout the state.

FY2003 funding of SPRING was a significant first step but funding in subsequent years has been and will continue to be necessary to build an effective infrastructure and to effectively operate the SPRING network of collaborations. SPRING complements recent major nanotechnology initiatives in other state, and will help Texas and the nation lead in the race for scientific and technological breakthroughs and product commercialization. By establishing SPRING, the participating universities are leveraging their combined capabilities and minimizing the cost of equipment necessary to advance the state of the art of nanotechnology. Significant funding for SPRING began in FY03. In 2004-2005, the collaboration will add the University of Texas at Arlington as the fourth partner and spin off a project called Nano at the Border with our two border sister campuses, the University of Texas at Brownsville and the University of Texas Pan American.

From August 25<sup>th</sup>-27<sup>th</sup> 2002, the first SPRING conference was held in Austin, Texas. Nearly 300 Texas top researchers, postdocs, graduate students, and industry representatives, participated in this ground-breaking event to report on their activities in nanotechnology research. The Conference attracted scientists not only from the above mention six institutions in Texas and AFRL, but also those from other universities in Texas, Oklahoma, United States Department of Energy and so on. The science and technology discussed in this Conference were the A-Z in this vast and penetrating field. The program of the Conference can be found in <http://www.spring.org/>. Detail and technical information can be obtained by sending emails to the primary organizer, Professor Paul Barbara ([p.barbara@mail.utexas.edu](mailto:p.barbara@mail.utexas.edu)).

The Vice-Presidents for Research and the directors of the nanotechnology centers at the participating universities jointly manage the SPRING program. UT SPRING funding will be used primarily to purchase, install, and maintain new instrumentation and tools in the core CNM/TMI research facilities. Most of the equipment will be moved to the CNM ESB wing, when it is completed in 2006. In FY2003 \$1.5M of SPRING funds at UT are being used to purchase 32 pieces of equipment including: a variety of thin-film deposition and fabrication equipment, a low temperature electrical transport apparatus (which will be a new type of core user facility for general use), a general purpose inspection video microscope system, a optical spectrograph system for molecular electronics in the MRC, and an upgrade for the Keck microscope facility, which will eventually move to the CNM ESB facility. In addition, 250K of these

funds was used toward the set-up packages of two new "nanoscience" Asst. Profs. In the Physics Dept. in support of the "cluster hire" in nanoscience that was approved by the Provost last year.

In 2003-2004 the participating universities (*University of Texas at Austin, University of Texas at Dallas, University of Texas at Arlington and Rice University*) continued to establish the infrastructure for SPRING, a collaborative network of shared centers of intellect, and experimental capabilities that will rapidly advance and promote nanotechnology in the region. The mission of SPRING is to foster nanoscience and nanotechnology research, education and technology transfer. SPRING is a collaborative effort between the U.S. Air Force, The University of Texas at Austin, The University of Texas at Dallas, The University of Texas at Arlington, and Rice University. An important and integral part of the SPRING collaboration is the participation of the Air Force Research Laboratory (AFRL) in Dayton, Ohio, which is under the command of the Air Force Material Command. The AFRL is a FULL research partner of this collaboration. SPRING is rapidly building a network of shared centers that will propel this region to the forefront of nanotechnology research. SPRING is achieving this through the development of intellectual and experimental centers for nanotechnology research that enable research collaborations both internal and external to the SPRING partnership, and instrumentation usage by companies and other universities throughout the state.

FY2004 funding of SPRING has continued to be used to build the infrastructure and to maintain the equipment facilities in the SPRING shared facilities.

Overview: The SPRING shared facility at UT Austin is located at the lower basement of ENS building, room 31 N. It houses over \$10M of equipment in four main areas of instrumentation and tools: electron microscopy, scanning probe microscopy, electronic & vibrational spectroscopy, and nano fabrication and testing. Interested users can find details either on the TMI website: <http://www.tmi.utexas.edu/core facilities.shtml> or on the CNM website: <http://www.cnm.utexas.edu/shared facilities.htm>. The CNM facilities offer a broad range of state-of-the-art tools on nanoscience and nanotechnology for hands-on use for UT students, faculty, and staff. The available instrumentation includes high-resolution transmission electron microscope (TEM), dual beam system (FIB/SEM), electron beam lithography (EBL), atomic force microscope (AFM), molecular force probe microscope (MFP), several thin film deposition systems, other tools for device fabrication and testing, laser spectroscopy etc. Individual and group tours of the facility for UT personnel and visitors are available through Dr. Saiful Khondaker (512) 232- 3694, [saiful@mail.utexas.edu](mailto:saiful@mail.utexas.edu). We also give demonstrations for outside groups including K-12 classes (by appointment only).

**New Instruments:** Last year the CNM added over \$1.5 million of equipments, thanks to the funding by SPRING and Keck foundation. The new instruments that have been added are widefield microscope, confocal microscope, bonding machine, optical microscope, and low temperature (300 mK) system with a magnetic field of 8 Tesla. Most of these systems are now open to users. Other new instruments that are in the process of procurement are optical lithography station (Suss MA6), profilometer, reactive ion etcher (RIE), ellipsometer, etc. These new facilities will be housed in a modular softwall clean room located at Welch 3.316. This clean room is expected to be operational by November 2004.

**Using the instruments:** The facilities are open to users, 24 hours/7 days. New users of any instrument will be trained by CNM staff. Last year, we trained about 50 new users on different tools. Users requesting training need to fill out a training request forms available on the CNM website. Usually trainings are conducted once a month and we request our users to apply well in advance. Experienced users can use the facilities 24/7 without any supervision. Most of our instruments can be reserved via our

online reservation system <http://www.cnm.utexas.edu/reservation.htm>. There is a fee for using the instruments which range from \$2 to \$40 per hour. Our fees are among the lowest in comparison with other major institution. Users are required to provide a valid UT account number for billing purpose and also required to fill out the log-book.

**Staff:** The facility is directed by Dr. Saiful Khondaker. He is assisted by a technical staff member. Last year Tim Blade joined us as a technical staff. However, he left us in August to join FEI. He had been very valuable in maintaining the FIB and the deposition facilities. We recently hired a replacement for Tim. His name is Mike Tiner. Mike worked for Motorola and AMD for many years and has experience in FIB, TEM, AFM and vacuum systems. We hope he will be a valuable addition to CNM.